The Northwestern MILLER

MILLING PRODUCTION SECTION

Science Sets Pace:

Here's an Example:

Progress in Grain Aeration Field

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Experiment Described

By Dr. Leo E. Holman and George H. Foster

Aeration has helped one Texas elevator operator solve some of his storage problems. Like most operators, he used to "turn" his grain—move it from bin to bin—to condition it. To do this he had to keep one of his five steel storage tanks empty.

He installed an aeration system with the help of an Agricultural Marketing Service engineer. Now, he doesn't have to turn his grain, and he has room for another 26,000 bu. of sorghum. The system paid for itself in less than a year.

Aeration probably won't eliminate all turning, but it seems to have a place in the future. It can condition grain just as well as turning—and sometimes a lot better—and it costs less. Once grain is stored, it may go out of condition for a number of reasons. Condition is affected by heat, molds, bacteria, insects, odors and other factors.

To combat these problems, elevator operators have long practiced turning grain. Some attempts were made to use aeration for this purpose in the '30's. However, early failures led to skepticism within the trade.

Recently, increasing reserves of grain have directed research towards aeration. Much of the early work was done on Liberty ships used to store surplus grain. Research has uncovered many of the early mistakes and provided practical aeration systems.

In aeration, outside air is moved through the grain by a fan. The fan is hooked with a duct that evenly distributes the air through the grain. In some cases, connecting ducts enable one fan to aerate several storages. After a while, the temperature of the grain comes down to that of the outside air. By cooling the grain, aeration does a number of things. It tends to minimize mold growth, fermentation and insect activity. Most grain molds and bacteria grow slowly, or not at all, below 70° F. Insect reproduction stops at grain temperatures below 60° F., and many insects die from starvation when grain temperatures drop to 40° F.

Aeration also equalizes grain temperatures, thereby preventing moisture migration within the grain mass. This is most important in the northern areas where variations often cause troublesome migration and accumulation of moisture. In the southern areas aeration is more important for removing heat than controlling moisture migration.

In the rice producing areas, it is used to hold undried or partially dried rice in storage between dryings. By doing this the undried rice can be held longer between passes through the drier, increasing drier capacity. Some operators claim they obtain considerable drying while aerating. Continuous aeration at least helps reduce rice temperatures and thus retards mold growth and other deterioration.

Marketing research engineers and entomologists have developed methods for using aeration systems to apply fumigants and to clear them from the grain. The fumigant can be recirculated through the grain by providing a return duct system. One grain elevator operator reports that fumigating with his aeration system saves him more than $12,000 a year. In some cases aeration may reduce the number of fumigants that are needed.

Continued research is needed to tackle existing grain aeration problems. AMS is doing just this at seven locations throughout the country: College Station, Texas; Lafayette, Ind.; Ames, Iowa; East Lansing, Mich.; Watseka, Ill.; Athens, Ga. and Manhattan, Kansas.

Tests have been conducted in Indiana with wheat stored in bins 150 feet deep. The wheat was cooled to 50° F., after 500 hours of intermittent fan operation. Power costs amounted to less than 1/10¢ per bushel. In Iowa, it was found that corn can be cooled too much. Additional work is being done to obtain optimum low grain temperatures. Research is being carried on in Michigan with dry edible pea beans. With the trend toward bulk storage of this crop there is added interest in aeration.

The application of aeration to sealed storages is being studied in Illinois. This method may supply sat-

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Research in Kansas Hunts for Improved Methods of Aeration

By Randall Latta

Marketing research, as it seeks better ways to fumigate stored grain, is looking hopefully toward aeration, which is one of the methods of fumigating currently under study by entomologists and engineers at the Manhattan, Kansas, Stored Grain Insects Laboratory of the Agricultural Marketing Service.

Researchers hope through tests to lower the cost of fumigating, to increase its efficiency, and to learn how to use fumigants that do not penetrate grains well by natural diffusion.

Aeration systems are used to condition grain by moving air through it. Early tests demonstrated that the volume of air used in aeration can

(Continued on page 10a)

ABOUT THE WRITERS

A major talking point in operative milling circles today is aeration. The need to store big surpluses of many kinds of grain has directed attention to that old problem, insect infestation. It has assumed new and bigger proportions. A group of writers makes some contribution to the thinking on the subject. Henry Marks recently addressed a joint meeting of District 8, Association of Operative Millers and the Cincinnati section, American Association of Cereal Chemists on the relation of duct sizes for effective distribution and operation of air in grain aeration. His talk is printed in this presentation. Further thoughts on the subject are presented by three members of the U.S. Department of Agriculture, an organization responsible for much experimental work because government is deeply interested in preserving the grain it has to take into surplus deposit. That is why the depositions of Dr. Holman, Mr. Foster and Mr. Latta are an important part of this presentation.

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Duct Sizes Important

By Henry Marks

When you contemplate the installation of an aeration system at your plant, good business practice dictates the need for a capable analysis of comparative values offered, in addition to the considerations of price.

While there have been many aeration attempts years back which have failed to do the job, there are some very good reasons why failure was inevitable. First, a thorough study of flow pressure relationships of various grains at various depths was not then available but is now defined by the pressure chart published by the American Society of Agricultural Engineers. Second, the lack of appreciation of the proportion between the volume of air to be moved into the grain and the size value of the duct work precludes good results.

Let us apply a little common sense and practical American ingenuity to determine what will we have to do to aerate. An air entrance, conveniently accomplished, must be made. This is self-explanatory except that you might remember it should not be made through a small restricting orifice. Obviously, the air entry chutes must be stoutly constructed to withstand the grain pressure.

Good air distribution to all corners of the grain is a must. The air must enter the grain with a minimum loss of energy. Stating it another way, the proportion of energy used to get the air out of the duct into the grain, as compared to that energy needed to get the air through the grain itself, should be small. This makes for efficiency.

If we do these four things and employ an efficient fan, then the desired aims will be accomplished.

Two Alternatives

Regarding distribution of air to all parts of the grain, you often have two alternatives to gain the same flow and cooling rate. You may utilize heavy fan capacity with small duct surface, forcing the air to distribute itself, or you may employ

(Continued on page 14a)

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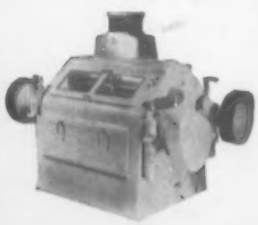
Latest Canadian addition to the go-ahead mills shown on the map is a new unit for Ogilvie Flour Mills Co. at their Royal Mills, Montreal. Occupying space originally designed for a 600 bbl. semolina mill, the new pneumatic unit has a capacity of up to 5000 sacks a day. Skilful planning and automation enables the screenroom and mill to be run by only two men per shift.



Among the modern high capacity machines installed at the Ogilvie mill are rugged Type G rollermills, with roller bearings for lower power consumption, and stacked up quadruple purifiers. The purifiers for the whole mill occupy only half of even the limited space available in the original 600 bbl. mill.

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HS 264/PS

The Influence of Pneumatic Conveying Systems On Explosion and Fire Dangers in Flour Mills

Just how great is the risk of explosion and fire in a pneumatic flour mill? Is the risk larger or smaller than that present in a conventional plant? German research men asked themselves these two important and related questions and the result was a determination to find the answers.

The investigation, carefully planned and executed, indicates that an explosion in a pneumatic mill is virtually impossible. Tests were carried out by the Institut fuer Bauforshung in Hannover, Germany, with the cooperation of MIAG, the German milling engineering firm. A test mill was constructed and included was a specially prepared test conveying system.

The institute's construction experts and the milling engineers published their findings in a comprehensive report. Frank Heide, vice president of MIAG Northamerica, Inc., arranged for a translation to be prepared and the report is appended.

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The manufacturing process in flour milling necessitates several transports of grinding stocks in a vertical direction up through all floors. On the way back, the stock passes through the different milling processes (sifter, purifier, roller mill, etc.).

This process, when used with elevators, needs a large number of conveying shafts throughout the building and a corresponding number of floor holes. These conveying shafts are made from well-dried wood.

More Fire Hazards

Room available on each floor is comparatively small and clear sight is difficult. A special exhaust system is used for cooling the grinding stocks and for aspiration of milling machinery (sifters and rollerstands). This aspiration system is made from wooden ducts and exhaust screw conveyors.

The greater danger of fire hazards in flour mills with this type of conveying system is proved by the following suppositions: Considerable concentration of burnable material not only in grinding stocks, but also in the construction material of the outfit (elevators, machinery, spoutings, ceilings and stairs). Large number of floor holes. Chimney effects of the conveying shafts. Limited sight and partially bad access to the plant rooms. Mixture of air and dust in the exhaust system.

One can assume as a frequent cause of fire: Overheating of bearings in machinery, especially slipping of elevator belts. Incautious handling of open fire (e.g., smoking). Defects in the electrical system (short circuit, damaged or not sufficiently insulated handlamps, etc.). Metal parts or stones in the grinding stock.

Since these conditions favor the spread of fire and small burnings, small fires, which cannot be fought in the beginning, may often lead to large fire damage and total loss of the building.

Effect of Change

How much then does the change in the conveying method from the usual elevator system to the pneumatic system influence the fire and explosion danger in flour mills? Here is what the investigation found:

In the pneumatic system, the grinding stocks are conveyed by suction with air speeds of approximately 20 m/sec. (4,000 ft. min.). Since the grinding stocks are cooled during transportation in the pneumatic tubes, it is possible to use metal spouting combined with pneumatic conveying instead of the wooden spouting formerly used. The pneumatic conveying plant furthermore takes over the aspiration of the processing machinery and makes the special exhaust system unnecessary. The wooden airducts and screw conveyors also become superfluous.

By the use of metal spouting instead of wooden shafts, the danger of fire inside the transportation system is greatly reduced. The system itself is not burnable and will protect the entire mill through better resistance against burning grinding stock.

The concentration of combustible material in milling concerns is limited to grinding stock and those parts of the machinery and buildings still made of wood. The spread of fire by burning parts of grinding stocks from the conveying system to the mill itself is thereby prevented. It therefore is also unlikely that a fire in the mill will spread to the grinding stocks inside the conveying system.

As to the advantages and disadvantages of increased transportation speed in regard to fire hazards, the experiments proved:

The burning of glowing grinding stock is at first actuated by the air suction. The burning matter, however, was practically extinguished by the cooling effect of the air current before it reached the highest floor and the separation process in the cyclone.

Only small particles of one test mixture, which, however, is never used in practical milling, passed the separator process still glowing. But their ignition effect was not sufficient to set fire to other materials.

Therefore the danger for the dust collector and the machinery situated behind the cyclones is theoretically very small. In spite of this, it would be wise to replace the wooden parts of the milling machinery with unburnable materials. All metal sifters and all metal purifiers are now available.

Compared to the elevator system, the space needed for the pneumatic conveying system will be considerably smaller because of the smaller cross sections of the lifts. The traffic space in the mill will thereby be larger, and the rooms or floors will be easier to reach and see. The daylight through the windows will be better and, with regard to fire safety, the control of the machinery will be much easier.

Concrete Floors

The small diameter of the lifts makes it easy to build concrete floors instead of wooden floors. Changing and replacing of pneumatic conveying tubes and steel spouts on concrete floors will require no more effort than changes of wooden elevator shafts on wooden floors. Concrete floors further reduce the dangers and effects of fire inside the building.

With regard to the effects of fire hazards, it can be stated that a remarkable reduction of the causes of fire as well as the possible spread of fire is realized with the installation of the pneumatic stock conveying system.

As to the dangers of explosion, the change to pneumatic conveying will theoretically have the following effects:

Hardly any dust sedimentation will be possible inside the conveying system, because the tubes are smooth inside and the air speed of 20 m/sec. (4,000 ft./min.) will keep the tubes clean. The dust sedimentation in the mill proper will be reduced by improved dust tightness of the conveying tubes and the spouting system. Moreover, the easier access to the rooms and floors facilitates the cleaning of the mill.

The load of stock in conveying air amounts to 1,000 to 4,000 g/m³ (28 to 115 g/cu. ft.). That means the mixture might eventually come into the known range of explosion danger which is 20-2,000 g/m³ (0.5-55 g/cu. ft.).

After separation of the stocks, all the air from the different cyclones is collected in the main air duct and is then led to the fan. This air has a dust load of 0.2-1.0 g/m³ (.0056-.028 cu. ft.). Normally, this dust concentration is below the lower range of explosion danger. It might be possible, however, that the load of dust is changed by disturbance and will reach the lower limit. On the other hand, the air current is far above 6 m/sec. (1,000 ft./min.) and by this the explosion danger is again considerably smaller.

The moisture content of the grinding stocks which are conveyed pneumatically is approximately 15% at the different grinding processes.

Static Electricity

Besides the dangers already listed, it had to be considered that the pneumatic conveying system carries static electricity which could be another cause of ignition. This static electricity is a result of the friction on the metal tubes. According to present experience, tensions of 1,000 to 2,000 volts can be expected.

Practical tests had to be made to answer these questions: (1) How great is the practical chance that the stock will come into the range of danger of explosion? (2) Do other circumstances, which have not yet been considered, have any effect on the explosion danger? (3) Where are the visible signs of possible explosions? (4) Have the tubes used for the lifts enough pressure resistance in case of explosion and will there be any danger for the surrounding area? (5) Are the loads of static electricity on the metal tubes large enough to constitute an ignition danger? Should any precautions be taken?

To find answers to these questions, different flours with different concentrations were conveyed in the test system which consisted of one pneumatic conveying line and grav-

DUST EXPLOSION—This is an artist's impression of one of the worst dust explosions in the past 100 years. The picture shows the start of the big blast that rocked Minneapolis in 1878.

ity spout. Then attempts were made with welding equipment to explode the mixture. With this test, it was found:

(1) The mixture repeatedly came into the range of explosion danger. A miller can assume that this also will happen in practical operations.

(2) Actually, it was only possible after a certain time (5 to 10 minutes) to bring the mixture, which was in the danger range, to an explosion. It is therefore to be assumed that normal moisture content of the mixture is too high to bring about an explosion. Explosions occurred only after the flour had passed through the pneumatic conveying system several times so that its moisture content was reduced.

(3) The only pressure damage to the tubes was some discolored spots and some slight damage to the outside finish. This shows that there is no danger to the surrounding area. Behind the cyclones the conveyed stocks were so cool that the machinery located there was not endangered.

(4) The conveyed tests mixture, even though it was in the danger range, could only be exploded by artificial ignition. An ignition caused by static electricity did not occur in any case. Therefore it can be assumed that grounding the tubes is sufficient to avoid ignition by static electricity.

Summing up the question of explosion danger, some factors become apparent which at first seem to suggest a theoretical higher degree of explosion danger with the application of the pneumatic conveying device in milling. The installation of smooth walled metal pipes which avoid dust sedimentation, for instance, results in a considerable reduction of any explosion danger.

Facts Compensated

The experiments have shown that the theoretically unfavorable facts do not have any practical effects since their dangerous characteristics are compensated by other favorable circumstances, or they can be prevented by easy-to-perform security precautions.

Careful earth connections of the metal tubes, including bridges on the sight glasses, and unobjectionable finishing and supervising of all electrical equipment according to codes and regulations are safety precautions, however, which should be observed in any case.

Altogether the investigations and experiments have shown that the use of pneumatic conveying systems guarantees a remarkable reduction of fire causes and fire spreading dangers. Their use means elimination of elevators and use of unburnable materials for the conveying and spouting system. There is elimination of the separate aspiration system and the smaller floor space needed for the new conveying system gives better access to and view of the plant. Spouts are dust tight and installation of concrete floors is simplified.

There is no increase in fire danger by the use of high speed conveying. Nevertheless, it would be wise to replace the wood in the machines and suction filters, etc., with unburnable materials wherever possible.

As far as the explosion danger is concerned, the pneumatic system eliminates the separate exhaust system with its dangerous air-dust mixtures. There is less dust in the entire mill and the conveying tubes have better resistance to explosions.

Theoretical disadvantages, like dangerous air-dust mixtures in the conveying system and ignition danger because of static electricity, are very small in practical operation and can probably be avoided by appropriate safety precautions.

The reduction of fire and explosion danger by installing the pneumatic conveying system, as proven by the results of this investigation, should not give way to the belief that the general safety precautions for flour mills could be abandoned or reduced. The practical experience of several years has to be acquired first.

This includes among others: Principal fireproof separations of the grain storage buildings and flour warehouses from the mill and grain cleaning house. Fireproof separation between the cleaning house and the mill proper itself. Construction of fireproof concrete floors. Fireproof separation between manufacturing rooms and staircases. Installation of electrical equipment according to the rules and regulations. Safe heating of working places. Unobjectionable earthing of the metal tubes used for pneumatic conveying of stock (including bridging of sight glasses). A sufficient number of emergency exits as well as access possibilities for fire brigades. Stationary fire extinguishers.

—BREAD IS THE STAFF OF LIFE—

Wheat Levy

MELBOURNE — The Australian government is considering the introduction of legislation requiring all wheat growers to pay a levy of about ½¢ bu. on all wheat delivered to the wheat board. The levy, which will yield about $390,000 on an average crop, will be used for research into wheat and soil problems.

Best Foremen Know The Human Factors

By ERNEST W. FAIR

The day-to-day problems of on-the-job supervision by a milling company executive over his men are never easy to solve. The ways and means used by executives and their foremen to simply "work" or to expedite that work always requires more and more study.

One of the factors which calls for endless investigation into better ways of doing the job is an understanding of the human factors involved in getting the most out of men. The modern machine needs only a friendly tap of a wrench or a portion of lubricant dessert to supply that cooperation. Not so the men who use those machines.

Here, from actual job experience, are some of the short cuts to practical application of methods for handling men. It may be noted they apply the psychological approach the worker's wife uses in getting him to do those extra chores around the house.

First is thorough realization that no man can work efficiently if he is not interested in his job. A dutiful husband may empty the garbage for the little woman, but he does it reluctantly. He will display the same lack of enthusiasm for his work on the job unless supplied a vital interest in that work.

Such an interest is inborn in some individuals. Every foreman knows that these men are scarce. It is one of the primary functions of his job to supply that interest to the men who work under him.

No job is too drab or routine, all have some element of interest. In many cases all the foreman must do is to discover that feature, or create it, and then point it out to the individual employee. In the routine of daily work we often overlook a score of such interesting factors. Whenever a deliberate effort is made to search them out these interests will become readily apparant.

The ultimate results of a man's work can often provide such interest. The routine skills he uses can be glamorized and made more important to him. Emphasis on more and more perfection (presented without wifely nagging) can arouse an interest in seeking perfection on any job. No foreman should ever overlook an opportunity to give such ideas to the men under him.

A second human factor we can profitably keep in mind is to always remember that ability can be developed if the correct attitude is present in the employee. Without proper attitudes no amount of sweat on a foreman's brow can develop ability.

Attitudes stem from interest in the individual's work as well as from the foreman's approach. Development of ability depends in great measure on the foreman arousing the proper attitude toward the work on the part of each man.

Where the individual has a negative attitude toward his work but indicates sufficient skill or ability to make the effort worthwhile, it will pay the foreman to exert a positive effort toward elimination of such negative attitudes. Until this has been done 90 percent of his teaching effort will be wasted.

"I give up on Mike . . . he's a stubborn mule and just won't learn . . . he has the wrong attitude," we once heard a foreman say. Mike may have been a stubborn cuss, but he probably had good reasons. The practical approach was not a continued pounding by the foreman on instruction at the job, but careful planning to remove Mike's obstruction. Once such a roadblock has been set aside the task of teaching and instruction, vital to every foreman's job, becomes as easy as feeding ice cream to a growing boy. Foremen who use this system accomplish their purpose by carefully searching for what lies behind the negative approach in Mike or his fellow workers. Once discovered these negative ideas are easily removed and positive ones supplanted. Then ability can be developcd to its maximum.

Another factor the wise foreman always keeps in mind is that abilities can remain hidden if no one tries to bring them out. No girl really knows how to kiss until she meets an expert. It seldom comes naturally despite what the songs declare. The ability to do a good job at any spot will likewise remain hidden until the foreman makes a deliberate effort to show the employee the proper response.

Times Change

Once upon a time there was no income tax . . . and once upon a time foremanship called for hard and fast taskmastership over the given skills of an employee. Now we have plenty of income tax . . . if we had as wide an application of a principle of intelligent approach by foremen toward bringing out and developing such skills and abilities supervision tasks would be much less exacting.

The First Foreman

Man really started taking over this earth in the prehistoric day when he began using his fingers and thumbs for purposes other than clouting someone else. Chances are one particular individual was the leader in

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bringing out those abilities. He was the foreman of prehistoric times.

Next on our shortcut list is to understand that the average man has a built-in resistance to change. Unless we keep this constantly in mind it will take us three to four times as long to develop major skills in a worker as it would if we approached our task without this principle. Old working habits must be changed in almost every case, and it cannot be accomplished overnight. The foreman who realizes that each man has such a resistance to change and approaches his day to day job problem with this in mind is the one who always secures the most with the least effort from his men.

It is also important to keep in mind that to "unlearn" an emotional habit one must learn another. That is a slow process. Try to hurry it and results will never be forthcoming. We are all creatures of emotion. The emotions necessary to proper approach to our jobs do not come naturally. In most cases we never acquire them unless we discard others which form a wall of resistance to new ideas.

Most experienced foremen are aware of this factor in handling men. But surveys show that far too many foremen have the idea these changes can be made quickly. It's a slow process, almost as slow as getting a new idea through the Russian political mind.

Where we have workers who are not satisfied with their jobs, yet show sufficient skills and abilities to warrant keeping on the payroll, the first step should always be an effort to discover the undesirable emotions and ways to relieve them. When this has been done conflict on the job is reduced.

Another factor of good foremanship which has been brought forth by several studies of men who are attaining top results at their jobs is that different appeals are required to obtain different results. One wife uses soft words to get her husband to do an unpleasant task. Another finds liberal application of the broom will bring more results. We have the same need for different approaches toward men on the job.

Formulas are nice. If we can discover a method of handling a given problem it simplifies our work. But when handling men at work there are no hard and fast formulas. Each man requires different appeals to secure maximum results. The foreman who uses this approach is the one whose staff has the best work record.

The human factors in good employee supervision are important as any other phase of the job. When made a routine part of procedure our tasks in handling men and getting the work done are always simplified.

JACKETS FROM BAGS — "Original and unusually attractive" was the comment of the cast of NBC-TV's "Today" show when they received sports jackets made from cotton flour and feed bags as a gift from the Fulton Bag & Cotton Mills, New Orleans, during the show's visit there. The jackets, made from the same Fulton striped denim bags in which rural housewives buy flour and feed, were worn on the show by Dave Garroway (center), Jack Lescoulie, sports analyst (left), and Frank Blair, news commentator.

The Proteolytic Activity Of Wheat Flour

EDITOR'S NOTE: This article was prepared by H. Zentner, research officer with the Bread Research Institute of Australia which has its headquarters in Sydney. Director of the institute is Eric E. Bond who addressed members of the American Association of Cereal Chemists at their annual meeting earlier this year.

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Wheat flour consists mainly of starch, proteins, small amounts of fats and mineral salts, all of which, with the exception of mineral salts, are subject to attacks by enzymes during the dough fermentation and the early baking stages.

The starch is attacked and degraded into dextrins and sugars by the amylases, while the proteins are attacked by the proteolytic enzymes, which break them down into fragments, the peptones, peptides and amino acids, the end result being a softening of the gluten and a change in dough properties. The fats are split into their components by the lipases or the fat splitting enzymes.

While the importance of the diastatic enzymes or amylases has been recognized for a long time, the part played by the proteolytic enzymes has been the subjeect of much controversy and, even now, their importance in the baking process has not yet been fully assessed.

The proteolytic enzymes of which there are many and which show an enormous variety in their mode of action fall into two general classes, those which split the large protein molecule into several large fragments, and the other group which splits off single amino acids from either one or the other end of the chain.

Mode of Action

Relatively little is known about the actual way in which proteolytic enzymes accomplish the job of breaking up the substrate, the substance on which they act. It is known, however, that as the first step, they attach themselves to the substrate molecule and form a compound. This compound then splits under the formation of the breakdown product and the enzyme which then is free to attack another molecule. It is clear, that the more accessible a protein, the easier it is for the enzyme to attach itself to the molecule, which means for instance, the more soluble a protein, the more easily it is attacked by the proteolytic enzymes. Furthermore, it is obvious that the more enzyme is present, the more protein is broken down in a given time.

Proteolytic activity can be measured by allowing an enzyme to act upon a protein substrate for a period of time under strictly regulated conditions of acidity and temperature, and then determining the amount of protein degradation products produced by the enzyme.

If the proteolytic activity of a sound flour is measured without any additional substrate, that is if the effect of the proteolytic enzymes of the flour on its own protein is measured, it is found to be very small. If however, another protein is added to the flour, it is found that considerable decomposition of the added protein takes place. In other words, flour contains quite powerful proteolytic enzymes, which however, do not act strongly upon the flour proteins. The main reason for this is that gluten is insoluble and therefore complex formation between the gluten and the enzyme can take place only to a very limited extent.

In sprouting wheat enzyme activity rises sharply, and as is well known sprouted wheat, malt flour and malt extract may be used to supplement the diastatic activity of a flour.

Enzymes in Dough

In a bread dough there may be two sources of proteolytic enzymes. First, the flour which has a certain though low, proteolytic activity and second, the malt extract of flour which is rich in proteolytic enzymes. However, in the amounts in which malt flour or extract is used in baking, the effect of the additional proteolytic enzymes on the gluten is not generally noticeable, because the gluten is too insoluble to permit the enzymes to attack it to any great extent.

Yeast contains proteolytic enzymes inside the yeast cells. These, however, do not penetrate the cell walls of intact unruptured yeast and therefore do not exert any direct influence on the wheat proteins. Recently, another source of proteolytic enzymes has become available in the fungal proteases which are finding increasing use.

Gluten forms part of the structure of the loaf, in the lamellar walls of the cells which contain the gas, the other part of the cell walls being formed by swollen and partly gelatinized starch granules. To retain the gas, the cell walls must have a certain strength and elasticity during fermentation. They must be in the correct physical condition of dough maturity. The breaking of a protein chain in a few places may have a beneficial effect in mellowing the gluten and making it more extensible.

As neither the proteolytic enzymes naturally present in the flour nor those added with the malt flour appear to have any noticeable effect on the gluten structure, what then is their importance, if any, in bread baking?

Indeed, text books state, that proteolytic activity has no noticeable

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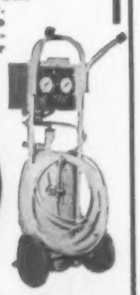
A Available in 2-inch shot can. One can equals knock-out strength of about a quart of conventional fumigant. Just punch and pour in fumigation ports now used. No handling bottles, wasted time, broken glass. No fumigant lost. Order case of 48 cans today.

B For large mills, use "Little Squirt" applicator. Two men can fumigate average mill in two hours. Cuts costs substantially. No equipment to buy. No initial investment. Ask for details.



DAWSON LOW-DOSAGE FUMIGANTS

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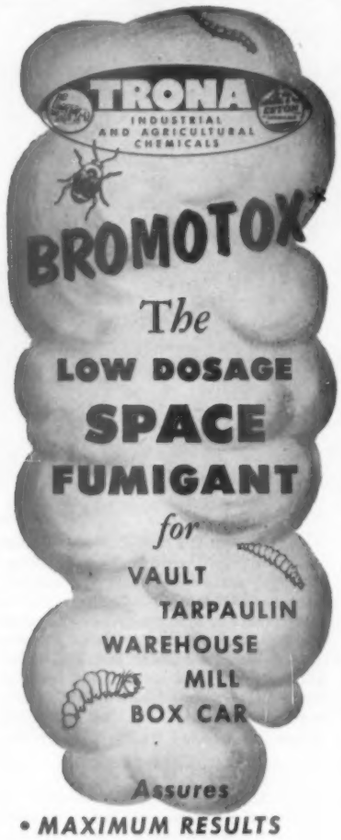
In Canada: Kipp Kelly, Ltd., Winnipeg and Toronto



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Bromotox, a mixture of ethylene dibromide and methyl bromide, is an effective, safe and economical space fumigant. The stronger odor and lower dosage requirements of Bromotox result in greater killing power, increased economy and maximum safety. It is longer lasting, more penetrating and leaves no residual odor. Bromotox allows positive control of granary and rice weevils, Angoumois grain moth, confused flour beetle, Mediterranean flour moth, raisin moth, cheese mites and many other pests infesting grain, flour, rice, cheese and dried fruits. Available in cans packed twelve per case as well as 10, 50, 120 and 170 pound cylinders.

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effect on bread making as long as sound flour is used. However, recent findings at the institute and elsewhere have convinced us that proteolytic activity may play a more important part in bread making than has hitherto been suspected. It appears, that although its direct effect on loaf quality is negligible, the effect of the end products of proteolytic activity, the peptides and the amino acids which are formed, has a strong influence on the fermentation and also on the crust color of the finished loaf.

From experiments conducted at this institute, it appears that lack of crust color in many cases may be attributed to lack of amino acid nitrogen in the dough. It is an established fact that substances with free amino groups, such as are formed through proteolytic activity, combine with sugars to give the pigments called melanoidins in what is called the browning reaction. In fact, the addition of amino acids to flours giving loaves with pale crust has resulted in a dramatic improvement of the crust color. The proteolytic activity of a wide range of Australian flours is now being determined to test the validity of the assumption that one of the reasons of pale crust color is low proteolytic activity of a flour.

Breakdown products of proteins can also influence fermentation to a considerable extent by their effect upon the yeast. The metabolism of the yeast may be affected directly through absorption of these compounds and indirectly by combination of these protein breakdown products with sugars making them unavailable for fermentation. Both these possibilities are being explored at present at the institute.

—BREAD IS THE STAFF OF LIFE—

Change Forecast In Future Wheat Export of Canada

WINNIPEG—Although it is dangerous to make too many assumptions with respect to the future production and the consumption of agricultural products, it is interesting to speculate upon the impact which Canada's steadily rising population is likely to have upon the quantity of wheat that may be eventually consumed at home, as well as upon the quantity that may be available for export abroad. This opinion has been expressed by W. G. Malaher, director, research department, Searle Grain Co., Ltd., Winnipeg.

At present, Canada's domestic usage with a population of some 16 million people is in the neighborhood of 160 million bu. annually, that is, roughly 10 bu. per capita. Thus, apart from any inward carryover stocks, and assuming an average crop of 370 to 400 million bu., there would normally be some 225 million bu. available for export or carryover. Based upon her present rate of population increase, Canada is likely to have some 25 million citizens by 1975. Thus, assuming the same rate of usage as now, domestic requirements may then have increased to about 250 million bu. or approximately two thirds of what is now considered to be a normal average crop.

But this is not the whole story, for the pattern of agricultural production in Canada is likely to undergo some changes in the next two decades. Foreseen is a larger acreage devoted to feed grains to support the greater livestock and poultry population required and the greater demand for such products as butter, cheese and milk; and there may be other claims as well upon some of the acreage that has traditionally been sown to wheat. Eventually, therefore, the wheat acreage in western Canada may well drop below the present level of 20.6 million acres, leaving a correspondingly smaller percentage of the crop available for export. When these changes come about, the burden of wheat supplies is not likely to hang so heavily as it does at the present time.

INCREASED CAPACITY

JUNIATA, NEB.—A new 300,000-bu. elevator annex of ten 138-ft. tanks is being built to the main elevator of the Juniata Farmers Cooperative Assn., Juniata. The new unit, scheduled to be completed in November, is the second major storage elevator constructed by the firm this year. The first was completed in April. The two new units, plus two other buildings, will give the firm a total storage capacity of 650,000 bu.

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P.O. Box 904 New Haven 4, Conn.

Sedimentation Test as an Index of Baking Quality

By A. J. Pinckney, W. T. Greenway, L. Zeleny
U.S. Department of Agriculture

The sedimentation test originally developed by research chemists of the grain division, Agricultural Marketing Service of the U.S. Department of Agriculture, to test the bread-baking quality of hard wheat has been altered. It can now also be used to determine the baking quality of soft wheat.

Since cake and pastry are made chiefly from soft wheat the test may prove useful in evaluating wheat used for these products.

The test is a very simple, rapid, and inexpensive way of determining the baking quality of wheat. It is a combined measure of the quantity and quality of gluten in wheat. Gluten is the protein material that gives bread dough its elastic properties.

The test's principal advantages over the conventional Kjeldahl protein test are its simplicity, speed, and the fact that it reflects differences in protein quality. Protein content as determined by the Kjeldahl test is a useful index of bread-baking quality, but wide differences in gluten quality limit the value of this test.

The sedimentation test is being used to some extent by the grain trade. It may eventually be used in the routine inspection of wheat, either through incorporation into the official grain standards or as a supplemental service offered by grain inspectors.

Many different factors, some of them not completely understood, affect the baking quality of wheat. And various standards are used to judge the quality of bread. Experimentally, the volume of the loaf is commonly considered one of the most important characteristics. But there are also other factors.

When other factors are properly controlled, the loaf volume is closely related to the quantity and quality of the protein present in the flour.

The importance of the protein content of wheat is well recognized throughout the grain trade. Protein is often a major factor determining the market value of wheat. High-protein wheat usually demands a premium price, often as high as 50¢ bu. in grain markets. Some grain exchanges provide the Kjeldahl test as a special service.

One reason for not incorporating protein as a factor in the standards for wheat is that the method and equipment for making protein tests are too cumbersome, time consuming, and expensive to be practical.

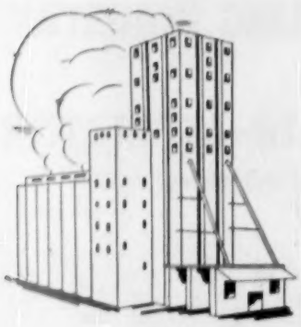
Today, the standards determine the potential bread-baking quality by the percentage of dark, hard, and vitreous, or hard, kernels in the wheat. Ordinarily, kernel texture is a very crude index of protein content.

Because of this, marketing researchers set out to develop a simple, practical test for use in the routine inspection of wheat. They hoped this test would also provide a more adequate classification of wheat in terms of potential bread-baking quality. Shortly thereafter they reported on the simple sedimentation test.

The test does not require expensive equipment or technical skill. The equipment consists of motor-driven, corrugated steel rolls and a 100-mesh sieve used to prepare the flour from the wheat; glass-stoppered graduated

Edward Smeadle

SALES ENGINEER — Edward Smeadle has been appointed direct factory sales engineer of Chicago Metallic Mfg. Co., Chicago. In his new position Mr. Smeadle will cover western Pennsylvania, parts of New York, West Virginia and Ohio. His appointment was announced by Jerome H. Debs, president. Mr. Smeadle has served the baking industry through the allied trades for 24 years.



In Case You've Wondered—

Weevil-Cide, in common with several other grain fumigants, has been in effect granted an exemption from tolerances under the Miller Amendment to the Federal Food, Drug and Cosmetic Act.

The Miller Amendment concerns safe levels of residues from insecticides in foods. The Food & Drug Administration was directed to establish these tolerances on each of the chemical compounds used as or in insecticides. Those chemical compounds used in Weevil-Cide were granted exemption from tolerances.

This exemption means that Weevil-Cide may be used with no additional precautions.

For Information, Write: THE WEEVIL-CIDE COMPANY
1323 Union Avenue Kansas City 1, Missouri

cylinders; pipettes; a stop watch; a balance; and a mixer.

The procedure itself is simple and rapid. It may be completed in 15 minutes and a number of tests can be made at the same time.

In making the test, a small quantity of flour is prepared from the wheat by a simple, rapid milling process. A weighed portion of the flour is mixed with a definite quantity of water in a cylinder.

Then a small amount of lactic acid and isopropyl alcohol is added with further mixing. After settling for 5 minutes, the volume of the sediment is determined by reading the cylinder scale.

The sediment consists chiefly of swollen gluten particles. The volume of the sediment depends on the quantity of the gluten present and the degree to which it has swollen. The swelling capacity of the gluten is closely related to baking quality.

From the protein content and the sedimentation value, a figure may be derived which is a measure of the swelling capacity of the gluten and of the baking quality of the flour.

To determine the usefulness of the test, researchers made large numbers of milling, baking, protein content, and sedimentation tests on samples of commercial and experimentally grown wheat over a period of years.

Comparisons of the results show that in most cases the sedimentation test is approximately equal to and in some seasons is superior to the Kjeldahl tests as an index of wheat quality.

—BREAD IS THE STAFF OF LIFE—

Canadian Wheat Exports Hiked 15,500,000 Bu.

WINNIPEG — Canada's August-September wheat exports totaled 50,952,000 bu., more than 15,500,000 bu. over the cumulative total for the initial two months of the 1955-56 crop year. September clearances alone were 24,622,000 bu. compared with 15,169,000 for the same month last year, according to the statistics branch of the Board of Grain Commissioners for Canada.

September flour export clearances, equivalent to 2,781,000 bu., boosted the two-month figure to 6,215,000 bu., or less than 100,000 bu. in terms of wheat over the August-September total a year ago.

During the first two months of the current crop year 17,542,000 bu. cleared for overseas from Vancouver-New Westminster, 8,704,000 from Churchill, 6,317,000 from Montreal and 1,309,000 bu. from Quebec. The remainder of 50,583,000 bu. wheat was cleared from Victoria, B.C., and other St. Lawrence river ports.

Total wheat clearances for August-September included 19,339,000 bu. for the U.K., 10,205,000 for Japan, 8,355,000 for Germany, 3,120,000 for Switzerland, 2,662,000 for Belgium, 2,435,000 for the Netherlands and 1,323,000 bu. for Norway. Canadian wheat in amounts less than the 1 million bushel mark was cleared to 19 other countries.

Canadian flour cleared to all destinations in the same two months included the equivalent of 2,273,000 bu. to the U.K., 988,000 to the Philippines, 453,000 to Venezuela, 278,000 to Trinidad-Tobago and 264,000 bu. to Jamaica. Fifty-two other destinations were listed for the remaining 6,215,000 bu. in terms of wheat cleared for export during August and September.

Cumulative oats exported for August and September at 1,978,000 bu. included 1,828,000 shipped to the U.S. Barley clearances for the same two months totaled 15,554,000 bu., of which 7,692,000 went to the U.K., 4,302,000 to U.S. and 2,230,000 bu. to Japan. The 1,031,000 bu. of rye cleared for export in the first two months of the 1956-57 crop year included 981,000 for the U.S. The export movement of flax of 973,000 bu. for August-September included 710,000 for the U.K. and 173,000 bu. for Japan.

David E. Linn John M. Krno

SALES PROMOTIONS — The Corn Products Sales Co., New York, has appointed John M. Krno to a position as manager of its bulk sales development, Corn Products Refining Co. At the same time A. N. McFarlane, vice president and general sales manager of the refining company, announced appointment of David E. Linn as manager of sales service, the position formerly held by Mr. Krno. Mr. Krno has been associated with Corn Products since 1917. Mr. Linn has been with the firm since 1930.

● At the check-out counter of a supermarket, a member of a research team asked a lady if she'd mind answering one question. She didn't mind.

"Why do you buy X brand of flour?"

"Well, white flour all seems pretty much the same today, but *this* brand clearly assures you that vitamins have been added. See, it tells you plainly on the package 'ENRICHED FLOUR' and lists the vitamins. We buy enriched bread and other foods with vitamins—so I say why not get that health advantage in the flour I use?"

The lady is absolutely right, and millions agree with her. That's why "ENRICHED" is a selling word.

But why *"Pfizer* enriched"?

For good reasons. To begin with, Pfizer has been a vitamin research and production center since the first vitamin was commercially produced. Bi-Cap® was one of the first enrichment concentrates. And this "head start" in vitamins has continued. What this means is that Pfizer can help you with the newest developments in enrichment products.

RIGHT NOW IMPROVED PFIZER BI-CAP is made with a new type of Riboflavin which gives it a *lighter color and overcomes unsightly agglomeration.* All three forms of BI-CAP are also made with Thiamine Mononitrate for better Vitamin B_1 stability.

Continued Pfizer research in riboflavin, thiamine and other health ingredients will help you offer your customers improved flour for tomorrow's improved bread and baked goods. Look to Pfizer for the finest enrichment concentrates.

Pioneer and Leading Manufacturer of Vitamins Pfizer

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KANSAS RESEARCH

(Continued from page 1a)

effectively distribute fumigants throughout the grain. These airflow rates fall in a range that permits one complete air change in 10 to 30 min.

Researchers have been using the aeration systems in two ways. In the "recirculation" method, the exhaust of the fan in the system is recirculated through the grain from top to bottom by a return duct in grain elevators, steel tanks, and "tight" flat storages. In other instances, like the hold of a ship, the exhaust can be diverted without adding a duct.

In one case two tanks were connected and the vapors were pulled down through one tank and up through the second.

Another Method

A second method, labeled "forced distribution," was initiated to eliminate the costs of ducts. This is for use in structures too "loose" for the recirculation method, and to keep the fumigant vapors in the top layers of the grain where they are needed. In this method the usual direction of the blower is reversed so that the air flow is upward from the bottom.

Volatile fumigants, such as methyl bromide, can be effectively distributed this way throughout the grain with very little waste. The so-called liquid fumigants can also be used in this method. They are applied to the grain surface in liquid form and the vapors are allowed to settle by gravity. After the vapors settle out of the surface layer, they can be pushed back to the surface where insects usually congregate.

The researchers have been using thermal-conductivity gas analyzers to quickly measure concentrations of fumigant vapors at various locations in the grain mass and storage structures.

Hollow Probes

Hollow probes with perforated tips are inserted into the grain to desired locations. The probes are connected to the gas analyzer by ¼-in. plastic tubing. The unit contains a tiny pump which draws a gas sample from the probe tip and passes it through the instrument.

A single operator outside a storage structure under fumigation can determine and chart the fumigant concentrations at a number of selected locations within.

When the desired exposure period is over, the vapors can be removed easily by a few hours' aeration. This permits use of fumigants that would injure the grain if the vapors were left to dissipate unaided, or those that must be controlled to avoid undesirable residues in the commodity.

Advertisement

INSIDE SCIENCE

A New Chapter In
The Vital Story of Bread Enrichment

by Science Writer

Lighting 15 Candles

1956 is a milestone in the trend to nutritional improvement of processed foods. It marks the 15th Anniversary of white bread and white flour "enrichment" in the United States.

Back in the late 1930's millers and bakers began the restoration of vitamin B_1 to their foods. Later vitamin B_2, niacin and iron were included. Then in 1941 the concept of "enrichment" came into being: restoration of B_1, niacin and iron and fortification with a *higher* amount of B_2 than originally present in the wheat berry.

The baking and milling industries deserve the gratitude of the nation for thus insuring better foods for the nation's better health.

What Diet Experts Say

Physicians, dietitians, nutritionists, public health experts have supported enrichment from the start and continue to approve the practice. For example, a prominent public health nutritionist has said:

> *". . . my first and most important suggestion to you—continue not only to enrich your white bread but continue to promote enrichment until all white bread in the United States is enriched, and continue to tell the public repeatedly and more effectively about the nutritional value of enriched white bread."*

The U. S. Department of Agriculture credits the enrichment of white flour and bread for major improvements in the per capita daily food supply. Said the Department in the 1955 outlook issue of its publication "The National Food Situation"—"Enrichment and fortification of grain products continue to make an important contribution to the nutritive value of diets, especially in thiamine."

Why Enrich?

Americans want *white* bread to eat. Millers and bakers want *white* flour because it keeps better and bakes better. To produce this fine product, millers must process the grain to a high degree of whiteness—unavoidably milling out some values known to be necessary for good health.

Enrichment restores the important lost nutrients. It puts white flour and bread on a par with—in many cases actually ahead of—whole wheat products in their content of these factors which are necessary to good health and well-being:

Thiamine (vitamin B_1)	Niacin (another "B" vitamin)
Riboflavin (vitamin B_2)	Iron

What Values Do the Enriching Vitamins and Iron Have?

Thiamine is the vitamin which helps build physical and mental health. Essential for normal appetite, intestinal activity and sound nerves.

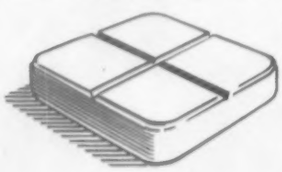
Riboflavin helps promote healthy body tissues and proper eye function.

Niacin is needed for healthy body tissues. Effective in treating and preventing pellagra.

Iron is the mineral used in enrichment. Essential for making good, red blood and in preventing nutritional anemia.

How Is White Bread Enriched?

Several methods may be used. In one, bakers use enriched white flour—flour which has been enriched at the mill according to federal definitions and standards of identity or state law.



Most bakers in the United States use a tablet or wafer. One of these contains enough thiamine, riboflavin, niacin and iron to enrich 100 lbs. of unenriched white flour—sufficient to produce 155 lbs. of white bread.

One popular form of wafer is known as "Square." Shown above in actual size, the "Square" wafer has many advantages for the baker.

Square wafers are distributed in two types by leading yeast companies throughout the United States:

Type A—for use in bread formulas requiring 3% or more non-fat milk solids.

Type B—for use in bread formulas requiring less than 3% non-fat milk solids.

How to Identify Enriched Bread

You can't tell enriched bread by its appearance or taste. If you live in one of the 27 states having laws requiring white flour and bread to be enriched you can assume you're getting these nutritionally improved products. But all packages of enriched flour, and all wrapped enriched white bread, must show the word "enriched." Look also for a declaration on your bread wrapper similar to this:

> 8 ounces of this enriched bread supply you with at least the following amounts of your minimum daily requirements for these essential food substances: Thiamine (vitamin B_1) 55%; Riboflavin (vitamin B_2) 17.5%; Niacin (another "B" vitamin) 5 milligrams; Iron 40%.

Wherever you go, insist on bread enriched with vitamins and iron for better nutrition—for better health—for better well-being.

Vitamins Are Made

While vitamins occur naturally in foods, most vitamins used in food processing are manufactured through the marvels of chemistry and engineering. At the huge Roche Park plant of Hoffmann-La Roche they are manufactured *by the tons*. Using amazingly complex processes with scientific production controls and intricate equipment, the Roche people produce pure vitamins that are equal chemically and in biological activity to Nature's own. So efficient are these operations that the vitamins are sold at lower prices than if they were extracted from natural sources.

This article is published as a service to the baking industry by a pioneer in enrichment—Hoffmann-La Roche Inc. Reprints are available on request without charge. Write to the Vitamin Division, Hoffmann-La Roche Inc., Nutley 10, New Jersey.

EXPERIMENT

(Continued from page 1a)

isfactory conditioning without the problem connected with using outside air.

In Georgia, aerated wheat stood from December to the following September without being turned. During the same period, non-aerated wheat had to be turned and fumigated three times. The costs of power for turning and for fumigant were seven times the cost of aeration.

Tests have been made in Kansas with aeration being done in stages. It may be done this way or in one step. It costs less in fan operation to cool in one step. However, grain must remain at high temperatures until the late fall.

Temperatures

In the Kansas tests, cooling was started soon after the bins were filled. Grain temperatures averaged around 100° F. Fans were stopped when the grain reached outside temperatures of around 80° F. Second cooling stage reduced grain temperature to 60°, and the third to 40° F. Each stage required from 200 to 300 hours of fan operation to cool the wheat to a uniform temperature.

Generally, aeration takes from 200 to 500 hours in a deep storage. It only takes three or four days in a flat storage of shallow depth.

The volume of air needed for successful aeration depends on several factors. These include geographical area, the kind of grain, the depth of grain and desired rate of cooling. Higher airflow rates are desirable in the South because grain temperatures are higher and there is less desirable cooling weather.

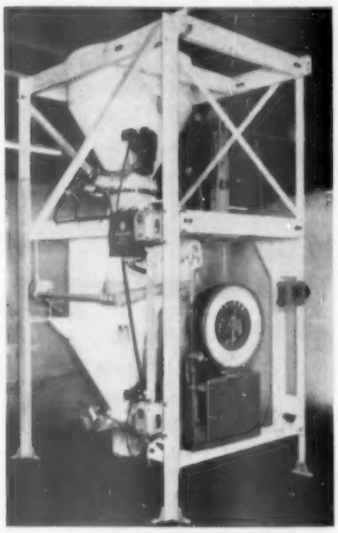
The resistance of wheat to airflow is greater than that of rough rice or grain sorghum, and several times greater than the resistance of shelled corn. Grain is generally aerated with air-flow rates of 1/10 cfm per bushel and lower. Recommendations call for at least 1 cfm per bushel for drying moist grain. Therefore, any drying accomplished during aeration will be minor. Cooling time is about the same regardless of the initial grain temperatures. In Kansas, it took the same amount of time to bring the temperature to below 40° F., when the initial temperature was 60° F., as it did when it was 85° F.

Buy and Sell Through WANT ADS

Worth Looking Into . . .

No. 4056—Bulk Flour Weigher

Remotely printed and totaled weight records of bulk flour are provided by a new bulk flour weigher announced by the Toledo Scale Co. The unit has a capacity of 40,000 lb.



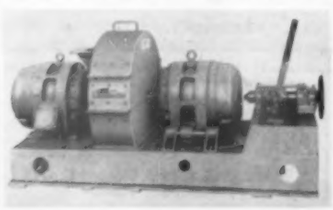
per hour with the individual drafts of flour weighing 1,000 lb. each. However, company officials say that the capacity is flexible and can be varied to meet individual requirements. They point out that only the actual net weight discharged is added to the cumulative total and any amount sticking to the hopper is automatically compensated. By printing the weight of the draft before discharge, and again after discharge, the weight of any flour left in the weigh hopper is automatically subtracted, giving the actual net weight of the flow discharged. More complete details will be mailed to you. Write to this publication quoting No. 4056.

No. 5502—Sprays

Larvacide Products, Inc., has announced the introduction of a new line of sprays and spray concentrates for grain protection and industry. The line, formulated with pyrethrins and activators, includes L-P industrial spray (a knockdown oil base spray for general purpose use), Servacide (for hidden insects) and L-P mist concentrate (for fog and mist blowers). For treatment of grain against insect infestation, the firm has developed a protectant formulation sold as Larva-Tectant. Descriptive literature is free upon request. Write to this publication quoting No. 5502.

No. 5561—Attrition Mill

Officials of the Strong-Scott Manufacturing Co. announce that the firm has introduced a new attrition mill.



The announcement states that "it is the first known mill of its kind to permit the use of standard motors either totally enclosed or open, ranging from 20 h.p. to 60 h.p." Safety features included are: Steel construction; special alloy iron spring cushioned plates; quick release protection of plates; and external adjustment of grinding plates. The mill is designed for grinding, shredding, fluffing or granulating a variety of materials ranging from fibrous to brittle in basic structure. Secure more complete details by writing this publication quoting the number shown above.

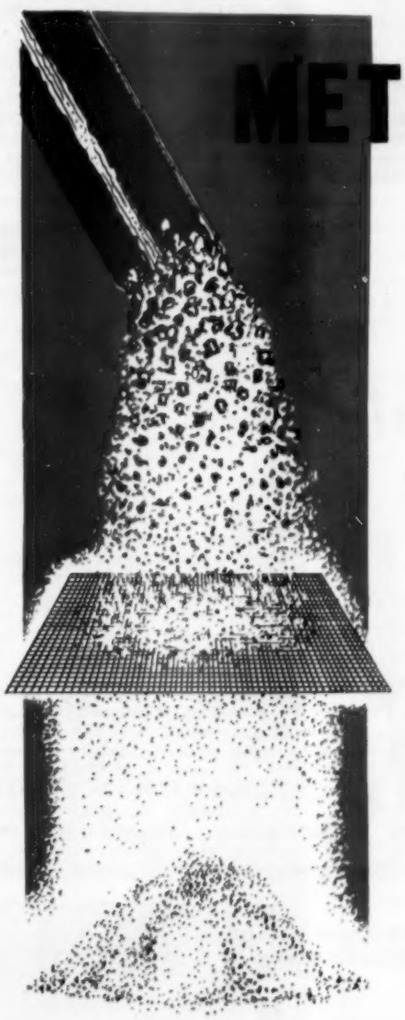
Early Grist Mills Topic of Article

TRENTON, N.J.—A study of grist mills and their contribution to agriculture and rural life in New Jersey has been published by the New Jersey Agricultural Society in a limited edition. The authors are two former members of the staff of the New Jersey Department of Agriculture, Dr. H. B. Weiss of Highland Park, who recently retired as director of the Division of Plant Industry, and the late Robert J. Sim of Yardville who served as entomologist until his death last November.

The book, "Early Grist and Flouring Mills of New Jersey," is the eleventh in a series on early New Jersey rural life published by the Agricultural Society since 1947. Circulation is limited largely to members, although copies are being provided for all libraries in the state.

Colonial Times

Grist mills were one of the first enterprises to be established in each early colonial community where natural water power was available, according to Dr. Weiss, who traces the history of grist flouring enterprises



METAL POWDERS

Disintegrated metals have many industrial uses today. Bronze and aluminum powders are used extensively in paints and for dusting prepared surfaces and many other metals are powdered for a wide variety of production usages.

When grading is essential, as it often is, the reduced powder must be sifted and silk, SWISS SILK, is the product widely used for this critical operation.

SWISS SILK is so versatile it is used for metal powder, abrasives, cosmetics, sulphur, salt and what is most important to the miller, it is the choice of the industry for sifting fine American flour.

Any product that must be sifted, sifts better through

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CEREAL CHEMISTS MEET—The Tri-Section of the American Association of Cereal Chemists met recently at Manhattan, Kansas. Some members and guests who took time from the regular routine of speeches to dine are pictured from the left around the table: James R. Fleming, instructor at Kansas State College; Lyle P. Carmony, Sterwin Chemicals, Minneapolis; Marvin Lawrenson, Colorado Milling & Elevator Co., Denver; John Whinery, Rodney Milling Co., Kansas City; James Doty, Doty Technical Laboratories, Kansas City; Gene Holm, Victor Chemical Works, Kansas City; Dale Reding, Victor Chemical Corp., Kansas City; Gerald D. Miller, assistant professor, Kansas State College. In the other picture are three of the principal speakers. From the left they are Max Milner, professor at Kansas State College; Charles S. McWilliams, quartermaster Research and Development Command, Chicago, and Kenneth Gilles, General Mills, Inc., Minneapolis.

crease grain capacity by 250,000 bu. The project includes 10 new tanks, with the space between making up the equivalent of 14 additional storage bins. Present storage capacity of Security Mills in Abilene is about 450,000 bu. The new addition will increase this to 700,000. The work is expected to be completed by the beginning of 1957.

—BREAD IS THE STAFF OF LIFE—

BEST CROPS

In Algeria, this year's crops are regarded as the best ever harvested both in quality and quantity. This is due to the very favorable conditions which were experienced during the growing season. The official estimate of this year's crops is as follows: Wheat, 48,000,000 bu. as against 44,500,000 bu. last year. Barley is expected to reach 40,000,000 bu. as against 28,000,000 bu. a year ago. Oats are estimated at 5,000,000 bu. which is a slight decrease from last year's crop of 5,400,000 bu.

from 1660 to 1955. Colonial New Jersey became an important wheat producing area on which both New York City and Philadelphia depended for flour.

As to numbers of establishments in the seventeenth century, the authors were reluctant to hazard a guess but they list 569 mills in New Jersey in 1794, 506 in 1840, 338 in 1850 and only 112 in 1955. During the same period the shifts in sources of power are described, beginning with water power derived from streams or tides followed in later years by wind mills, steam, gasoline and electricity.

Sources and types of millstones and their preparation, maintenance and dressing are described, as well as the early manufacture of flour and meal. Other subjects covered include the status of the miller in early colonial days, early legislation setting up quality standards, prevalence of explosions and fires, the prevailing toll allowed the miller and the shift from flour production to present day milling of poultry and dairy feeds.

—BREAD IS THE STAFF OF LIFE—

MORE STORAGE CAPACITY

ABILENE, KANSAS — Work is underway on new tanks at the Security Mills elevator, Abilene, to in-

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Oregon College Experiments Eye Better Wheats

Helping plant scientists select and develop new wheat varieties with superior milling qualities is the goal of a four-year study under way at the Oregon State College Agricultural Experiment Station. The study includes work on a quick, inexpensive way to check milling quality of wheat.

Plant scientists need some easy way to determine milling quality of wheat lines used in breeding experiments in order that only wheats with desirable milling qualities are used as parent stock, according to Wilson Foote, OSC agronomist heading up the study. Present methods of determining milling quality require a fairly large amount of wheat and are expensive and time consuming to run.

Foote reports that studies at the USDA Western Utilization Laboratory, Albany, Cal., have indicated that differences in milling quality between wheat varieties may be predicted by the differences in the amount of pentosan, a chemical compound found in wheat kernels, that can be extracted from wheat kernels with an acid.

Following this lead, the present study will try to simplify the acid extracting process and work out a simple method for routine examination of large numbers of samples. The new method will be used to check the acid extractable pentosan content of a large number of wheat varieties, and the pentosan values obtained will then be compared to the actual milling qualities of these varieties to establish whether pentosan content actually does indicate milling quality.

About 100 spring wheat varieties were grown near Pendleton this year and will be checked this winter, Foote says. And more than 200 winter wheat varieties have been planted this fall for test next year. In addition, crosses have been made between good and poor milling wheats to study the inheritance of pentosan content.

The study is being supported by a $22,000 grant from the western utilization branch of the USDA agricultural research service. Working on the study with Foote are Paul Weswig, agricultural chemist at OSC and Charles Rohde, agronomist at the Pendleton Branch Experiment Station.

—BREAD IS THE STAFF OF LIFE—

RUSSIAN EXPORTS

In Russia, known commitments of wheat exports to non-communist countries up to the middle of October amounted to approximately 40 million bu. This is almost three times as high as those of 1955 and twice the amount of 1954. Egypt will import 15,000,000 bu. and Yugoslavia 11,000,000 bu. Denmark, Norway and Finland are the other buyers of this year's exports.

—BREAD IS THE STAFF OF LIFE—

FRENCH REQUIREMENTS

In France, it is expected that 74,500,000 bu. of wheat will be imported during the 1956-57 cereal season to cover domestic requirements and to have a small carryover. This is against 104,000,000 bu. of barley which will be exported during the same time. In addition to the barley export, some 200,000 tons of wheat and wheat flour must be exported to Germany against long term contracts.

—BREAD IS THE STAFF OF LIFE—

OLD MILL

In the New England Village of Sturbridge the people have recreated homes and shops to show how people lived in the late 18th and early 19th centuries. Included is an ancient flour mill.

The Well-Proportioned Nutrients in Enriched Bread
Equally Important in LOW-RESIDUE DIETS
AMERICAN BAKERS ASSOCIATION

NEW SERIES — The Bakers of America Program of the American Bakers Assn. has launched a new series of medical advertisements to promote the use of bread products. Particular emphasis will be given to the nutrient value of enriched bread. In the first advertisement, reproduced here, the low-residue diet is explained.

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BULK STORAGE
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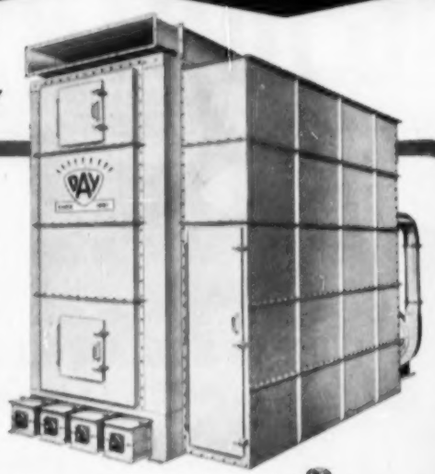
SERVE THE MILLING INDUSTRY



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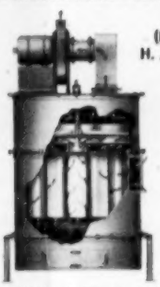
Exclusive DAY design provides high efficiency with low horsepower requirements. Write for Bulletin 49DC.



TYPE "RJ" DUST FILTER

Surge of high velocity reverse air maintains filter media porosity of this "packaged" dust filter, 99.99+% efficiency. Write for Bulletin 560.

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High air delivery per horsepower required. Statically and dynamically balanced; designed exclusively for dust control applications. Write for Bulletin 471.

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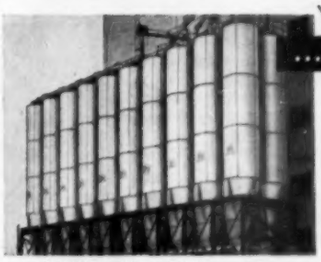

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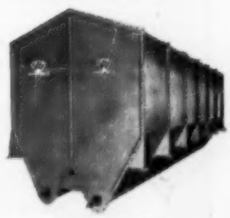

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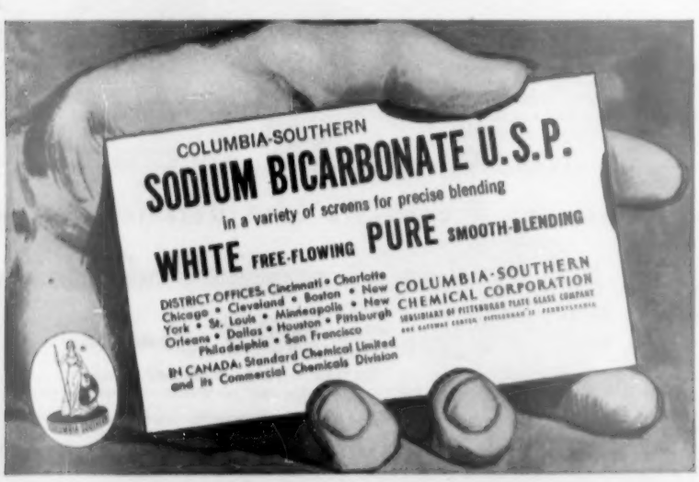
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DUCT SIZES IMPORTANT

(Continued from page 1a)

low fan capacities with a consequent need for increased distributive duct which will cause less resistance to air distribution. In a number of cases I have been surprised to discover that initial cost has been comparable in either of these approaches, but lower operational cost accrues with less horsepower.

Here are two practical cases in which I have been involved:

In the first case, the prospect asked for a bid. One concern proposed the use of two 3 h.p. fans with a minimum duct work attached to each. For the same work another concern proposed considerably more elaborate duct work but one ¾ h.p. fan. The customer was a little afraid of ¾ h.p. and decided upon one 2 h.p. unit for this job.

In the second case, a very deep tank, relatively small in diameter, was proposed for aeration. One concern offered the use of perforated pipes attached to opposite sidewalls of this tank from the bottom to the top. A small fan would have to be installed in one of these pipes exhausting the air from it, bringing the air through the grain from the other pipe. This device, of course, required less fan capacity to gain the same flow rate because the distance of air travel through the grain was shorter than it would have been had the air entrance been made from the bottom, requiring the movement of air through the whole mass vertically.

Key to Selection

The other approach to this installation required a much lower cost duct placed in the bottom with the added cost of additional fan capacity required to force air through the entire mass from the top to the bottom. In this case, it becomes obvious that the customer was required to choose between equally good systems accomplishing the same work. The key to selection, after establishing equal work bases, became the consideration of cost.

It is probable that you will be offered as many different methods as there are men who offer to sell you aeration. Here are a few of the points you might keep in mind when listening to a story:

Air velocity in the duct probably ought not to exceed 1,500 ft. per minute. You are all quite familiar with the practical aspects of the flow of water in pipes. You wouldn't think of attempting a job requiring too much energy input because the pipe was too small to carry the water needed. This would cause excessive friction and a waste of energy. The same is true in regard to our air-moving problem in the duct.

We must also concern ourselves with the duct pattern for length which will get the air in to all parts of the bin. You may think of this distribution problem in terms of length of lines.

If you want to buy aeration, take your ruler and lay out your air distribution lines before you buy. As long as the length of the lines approaches each other with a small ratio of difference, go ahead and get the system installed because it will aerate the grain.

But when the difference in the length of these lines becomes too great, the distribution of air in your bin will be very poor. It will take too long for the air traveling along some of the lines to do the job and the system won't be uniform in results.

The amount of perforated surface of the duct is worthy of emphasis. While you may be designing for airflow rates of small magnitude, 1/10, 1/20 or 1/30 c.f.m. per bushel, which appear very small, there may be, for example, a total of 3,000 c.f.m. which must go from the duct to the grain through this perforated material. Let us name any point inside the duct as Mutt and any point opposite that in

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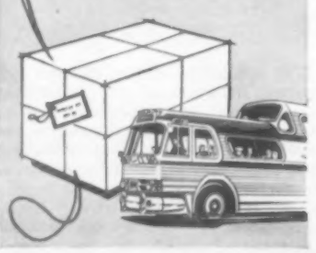

the grain one foot from the duct as Jeff. When air moves from Mutt to Jeff there is a pressure drop, which we feel should be minimal. For example, 3,000 c.f.m. and a duct with 100 sq. ft. of perforated surface would result in a flow rate of 30 c.f.m. through each square foot of duct surface. When this flow rate of 30 c.f.m. is applied to wheat, the air traveling from Mutt to Jeff would account for approximately 9/10 of an inch of water pressure. If, for example, the resistance to air flow through 48 feet of wheat were 4 inches, the resistance between Mutt and Jeff would approximate a 25% increase.

On the other hand, supposing that the duct had only 50 sq. ft. of perforated surface, then dividing 3,000 by 50 the flow through each foot of duct surface would be 60 c.f.m. per foot, which would occasion a pressure drop from Mutt to Jeff of almost 2½ inches of water pressure. This would be an increase of 62½% in pressure, due to that short distance from Mutt to Jeff, and would cause an increase in fan requirement of substantial nature.

At least 20% of the perforated sheets for duct surface ought to consist of holes. For example, there is one duct offered with 5% opening which would cause a further increase in fan requirement. Adequate perforated surface of the duct is needed to hold the increment of the initial drop in pressure low in relation to the pressure occasioned by the grain itself. In order to get adequate air distribution, meaning long enough ducts and adequate perforated duct surface, you might use a rule of thumb like this: Ten percent of the floor surface area of your structure should be the perforated area of the duct and this should be well distributed. Note that in the shallow tank, while you may meet a requirement of 10%, extra duct lengths may be required to avoid poor flow lines.

Opening Factor

Looking backward to early aeration attempts, some of the failure might have been due to lack of consideration of this duct surface opening factor. Fifteen or 20 years ago there was one system which used the open ends of six or eight 6-in. pipes. Those six or eight open ends were the only way for the air to get into the grain. Compare this with the 100 sq. ft. of perforated duct surface now recommended.

Related to the duct problem inside the tank is the manifold connecting device often offered for the use of one fan for a multiple bin installation. There are some advantages to the manifold installation, but there are some reasons why these devices in many cases are not the best way to do it. However, it may be valuable to you to give consideration to unitized control, that is, individually energized tanks for aeration, which lead to considerable efficiency over the years.

One of the best publications for over-all understanding of the process of drying, air movement, spoilage, etc., is that of the American Association of Cereal Chemists entitled, "Storage of Cereal Grains and Their Products," published in 1954. Reading this work will be valuable to you and will refresh your memory on a lot of things with which you already have been familiar.

Install your aeration system with maximum leverage for the power. Aeration is much like the Fat Man's Squeeze at Rock City on Lookout Mountain. It is easy for a little flow to coast through, but the fatter they are the more energy you need to shove; and when the amount of fat going through the squeeze gets too great, no amount of energy will move it. Therefore, if you have a fan for aeration of your grain, the duct should be larger than Fat Man's Squeeze so that air moves through easily.

Remember it is pretty well established that aeration is highly effective for cooling and the technique of achieving cooling action is well established. The technique in reverse of what to do after it is cooled still is very much up in the air. Even in the face of this it is less expensive to turn air through grain than it is to move grain through air. Aeration has not been quite as well packaged as the ready-to-bake add water or milk mixes so wonderfully devised by millers.

v v

Mr. Marks is associated with the Ewing Foundry, Indianapolis.

—BREAD IS THE STAFF OF LIFE—

AUSTRALIAN WHEAT

In Australia, the new wheat crop's marketable surplus is expected to reach approximately 115,000,000 bu. This is considerably lower than last year's 181,000,000 bu., as a result of lower precipitation in the main producing areas.

—BREAD IS THE STAFF OF LIFE—

GERMAN IMPORTS

In Western Germany, import requirements for wheat are estimated at 73,000,000 bu. and imports of brewing barley at 12,500,000 bu. The grain harvest is now completed although it was very much delayed due to unfavorable weather conditions which prevailed during September. Damage to the crops varied with locality.

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Sanitation Course

MOSCOW, IDAHO—Grain handlers in other parts of the U.S. are looking to the Pacific Northwest for ideas and practices that will help promote grain sanitation, according to Merrill D. Sather of Spokane, executive secretary of the Pacific Northwest Grain Dealers Assn. Speaking at the third annual grain sanitation short course at the University of Idaho, Mr. Sather pointed out that this area's educational program, beginning in 1950, preceded by several years the national clean grain program now in operation. "We were way ahead of the parade," he commented.

Western states are pursuing aggressive research activities to preserve regional leadership in the field of grain sanitation, said H. C. Manis, head of entomology at the University of Idaho. Six states, Oregon, Washington, Idaho, Arizona, California and Colorado, have active projects in some phase of stored grain insect control.

The two-day short course, attended by approximately 75 grain handlers, millers and research men from Oregon, Washington and Idaho, closed in the university entomology laboratories. There, under the direction of A. R. Gittins, assistant entomologist, the men who handle the region's grain got a chance to brush up on their ability to identify the many insects that cause trouble in stored grain.

SPECIAL GUEST—Mrs. C. O. Swanson, wife of the late C. O. Swanson, who headed the Kansas State College department of flour and feed milling industries more than 25 years, was a special guest at the 28th annual Tri-Section meeting of the American Association of Cereal Chemists last week at Manhattan, Kansas. Since the death of her husband several years ago, Mrs. Swanson has continued to attend the annual meetings faithfully. Here she is talking to Clinton L. Brooks, Merck & Co., Inc., Rahway, N.J., AACC secretary. Lawrence Zeleny, Washington, D.C., AACC president, is at the right.

—BREAD IS THE STAFF OF LIFE—

WHEAT IN SWEDEN

In Sweden, according to recent reports, the wheat crop is estimated at 29,000,000 bu. With this production, approximately 6,000,000 bu. are expected for export. The rye crop is expected to reach 6,500,000 bu. and the feeding crop will be close to 2,300,000 tons. This is considerably larger than that harvested last year. Barley is now being sold, largely to Denmark and Western Germany.

—BREAD IS THE STAFF OF LIFE—

PROGRESS IN NEW ORLEANS

NEW ORLEANS—The dollar value and tonnage of imports and exports following through the port of New Orleans will be appreciably higher this year than in 1955 if present trends continue. This forecast has been made by Clarence J. Kirby, statistician for the dock board.

HISTORIC RECIPES SAVE THE DAY

WASHINGTON—The homes of some of America's greatest historic personages—in danger of being abandoned for lack of funds for upkeep—are being saved by a new and novel idea.

Old, favorite recipes of such renowned families as the Washingtons, Jeffersons and Lincolns are being resurrected by the National Trust for Historic Preservation. The recipes are adapted to consumer cake mixes, then sold, and the royalties turned over to the NTHP for its important work.

The initial recipe that blazed the trail for others came from the family of George Washington, and was for a gingerbread mix. It was followed with a recipe for "little fine cakes" from the cookbook of Martha Washington, another for white cake from Mrs. James Monroe, a recipe for pound cake from Mrs. Thomas Jefferson, and, in Springfield, Ill., a recipe for yellow cake from recipes of Mrs. Abraham Lincoln.

GIVING THE MILLER WHAT HE WANTS

Airborne achievement

A line of "Pneu-Flow" rollermills installed in the basement of Chelsea Flour Mills, London.

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"Pneu-Flow" allows far greater freedom in mill design, saves floor-space and power, and vastly reduces the risks of infestation. For a new mill or a remodel, "Pneu-Flow" represents the milling system *par excellence*.

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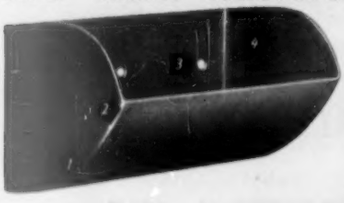

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If Your Lab Is Overloaded
Sanitation Analyses - Wheat and Flour
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M. M. Mills

SALES MANAGER—M. M. Mills has been appointed sales manager of the bag division, New York branch, of Fulton Bag & Cotton Mills, according to announcement from Jason M. Elsas, vice president and general manager of the bag division. Mr. Mills has been in sales work for several large eastern manufacturers, and was, at one time, regional sales manager for another nationally-known bag manufacturer. He left a position as general sales manager for a large paper specialty products firm to join Fulton.

Work on Feed Mill Cost Study Nears Completion

KANSAS CITY — Field interviews have now been completed in the feed production cost study being conducted by the Midwest Research Institute, Kansas City, Richard Witherspoon, head of the project at the institute, reported this week.

The data collected are now being organized into three mill size groups, for the purpose of studying equipment requirements and man hour standards, and the work will be completed in the near future.

Sponsored by the Midwest Feed Manufacturers Assn., the cost study will be presented as a major item on the program of the Midwest Feed Production School in Kansas City Dec. 4-6. The finished study will be turned over to the association shortly to allow final preparation of plans for the presentation at the school.

When completed, the survey is expected to provide cost standards at eight important points in the feed manufacturing process for three sizes of mills—30, 100 and 200 tons capacity per eight-hour day. The eight "centers" for cost study are: Receiving of ingredients, grain processing, mixing, high molasses feeds production, pelleting, packaging, warehousing and loading, and maintenance.

Following is an outline of the in-

France-U.S. Grain Barter Deal Pending

WASHINGTON—The long delayed French housing deal between France and the U.S. Department of Defense is now beginning to develop. It is unlikely that the project will result in export demands for U.S. grain in less than six months at the best.

The most recent information is that the French government has certified four U.S. grain exporters as eligible for participation in the contacts. They are Cargill, Inc.; Continental Grain Company; Leval & Co. and Bunge-Garnac. The latter appears to represent a juncture of two competitive firms.

The deal will be essentially a barter deal involving only Commodity Credit Corp. wheat stocks.

The bids submitted by firms named were based on an original outlay of $50 million but it is now noticed that the effect of inflation in France has boosted the bids to almost a $60 million level. This increase probably will come under the surveillance of the U.S. Department of Defense and may be subject to rejection.

Even if the deal is affirmed between the U.S. and France, it will not involve a substantial amount of U.S. wheat—and it may not be a commodity market factor since it is barter grain—and it is unlikely that it will be an export factor for many months ahead.

However, the presence of barter wheat in the export outlook — and barter wheat is now the cheapest wheat in the world market—can become a price factor no matter when called from CCC and exported.

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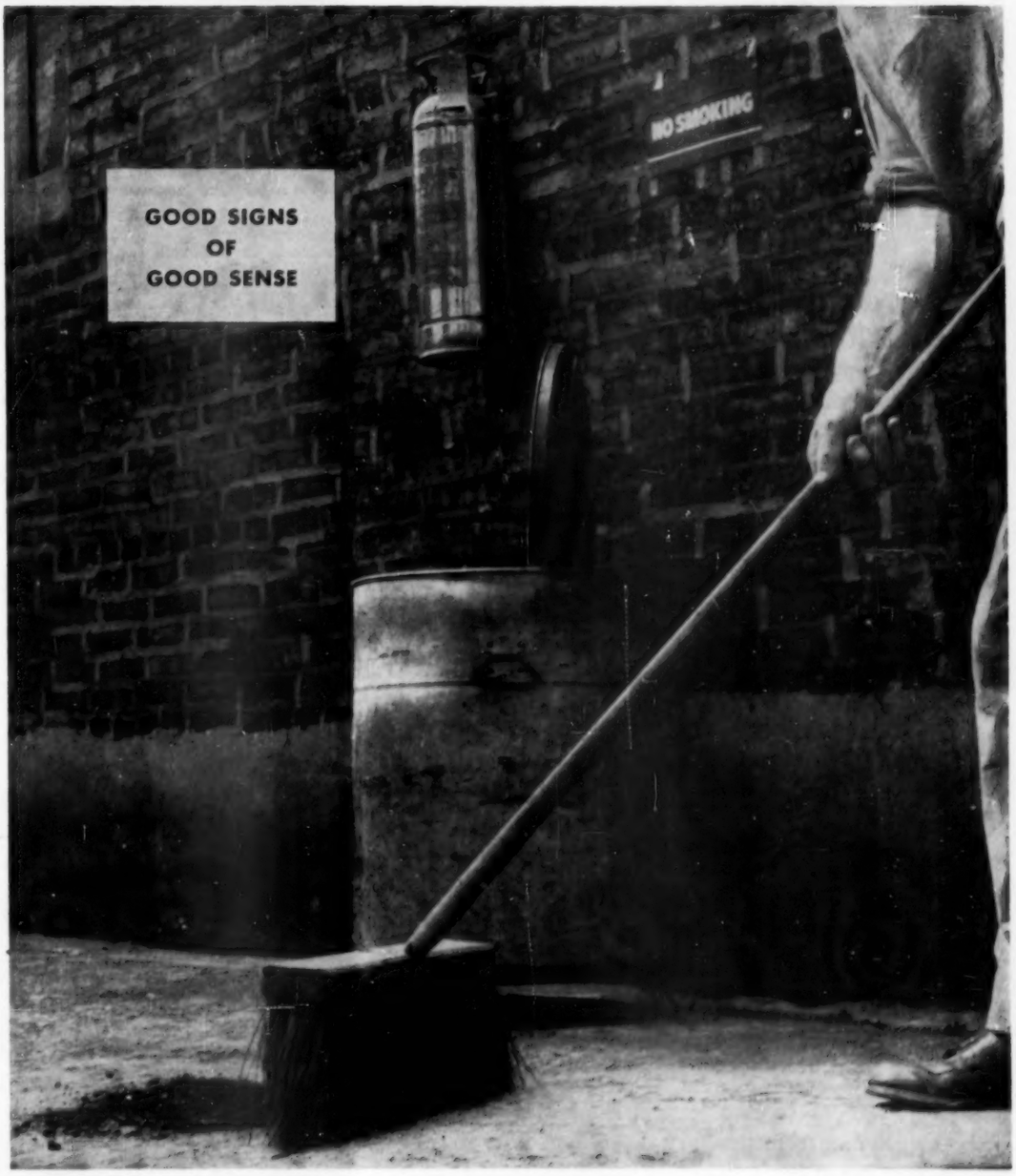

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COST STUDY DISCUSSION—Details of field interviews with feed manufacturers in the Midwest cost-of-production study are discussed here by William Bailey (left) and Richard Witherspoon (center) of the Midwest Research Institute, Kansas City, with Lowell Judd (right) of Albers Milling Co., Kansas City. This discussion was one of several in connection with the survey which will be presented in final form at the Midwest Feed Production School, sponsored by the Midwest Feed Manufacturers Assn., Dec. 4-6 in Kansas City. Mr. Judd, who discussed the subject of costs at the production school last year, is superintendent of the Albers plant in Kansas City, one of the few feed mills in the industry with a standard cost system now in effect.

formation obtained by the interviewers in each mill for each of the eight cost "centers."

A. Basic Requirements of the Operation.

1. Types, number and amount of items to be handled, received, processed, stored, etc.

B. Equipment Required by "A."

1. Number, capacity, power and type of all major pieces of equipment required by the operation.

C. Description of Method of Doing Work and All Work Performed.

1. Jobs performed, distances traveled, how work is accomplished, etc.

D. Schematic Flow Diagram and Layout.

1. Basic flow of materials.
2. Layout features in general, significant distances, etc.
3. Cost points indicated on diagrams.

E. Standard Man Hour Data.

1. Direct labor (each cost point time standard with brief job description).
   (a)
   (b)
   (c)
   _____
   Sub-Total
2. Indirect labor
   (a)
   (b)
   _____
   Sub-Total
3. Non-working foremen
   _____
   Total
   _____
4. Major equipment total costs (non-building items) _____.
5. Regular maintenance work (dies, etc.) $_____ man hours _____.
6. Estimated KWH per ton for this cost center _____.

The field work revealed that very few feed mills keep maintenance cost records or have a well developed maintenance program, Mr. Witherspoon said, in commenting on the field interviews with feed manufacturers. There is great room for improvement in this area, he said.

Production costs in feed manufacturing vary widely because of certain non-manufacturing conditions, Mr. Witherspoon observed in his contacts with feed manufacturers. A basic source of difficulty arises from sales problems. Seasonal variations in sales, quick delivery requirements, large number of formulations to be mixed, daily variations in orders—all are factors which raise costs and make the best performance difficult.

Another factor in which feed manufacturers are showing considerable concern, Mr. Witherspoon found, is the capital requirements for production. The problem of finding the proper ratio of investment in buildings and equipment in relation to capacity and production is a source of concern to many operators, especially those of medium and smaller size.

——BREAD IS THE STAFF OF LIFE——

Feed Firms Continue To Modernize Mills

A further indication of the continuing trend toward modernization and expansion of feed mill facilities is found in a recent report from the Prater Pulverizer Co., Chicago.

The report tells of recent installation of "Blue Streak" mills, mixers, conveying equipment and other machinery in 18 feed mills in the states of Illinois, Iowa, Wisconsin, Missouri, Indiana, Michigan, Louisiana, Connecticut and Ohio. Some of the installations include extensive additions of various types of new machinery.

The report also notes recent installations of Wenger Molasses Mixers in several feed plants in Indiana and Wisconsin.

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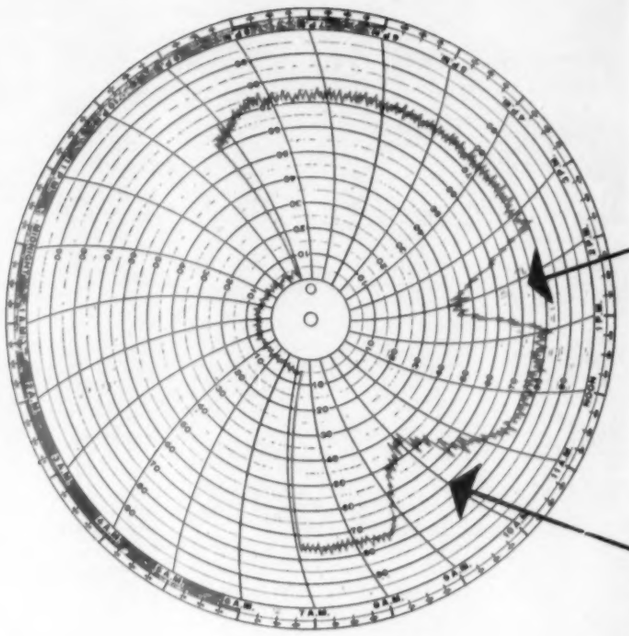

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